

BIOLOGY
HIGHER LEVEL
PAPER 2

Wednesday 13 November 2002 (afternoon)

2 hours 15 minutes

Name

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Number

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INSTRUCTIONS TO CANDIDATES

- Write your candidate name and number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Section A: Answer all of Section A in the spaces provided.
- Section B: Answer two questions from Section B. Write your answers in a continuation answer booklet, and indicate the number of booklets used in the box below. Write your name and candidate number on the front cover of the continuation answer booklets, and attach them to this question paper using the tag provided.
- At the end of the examination, indicate the numbers of the Section B questions answered in the boxes below.

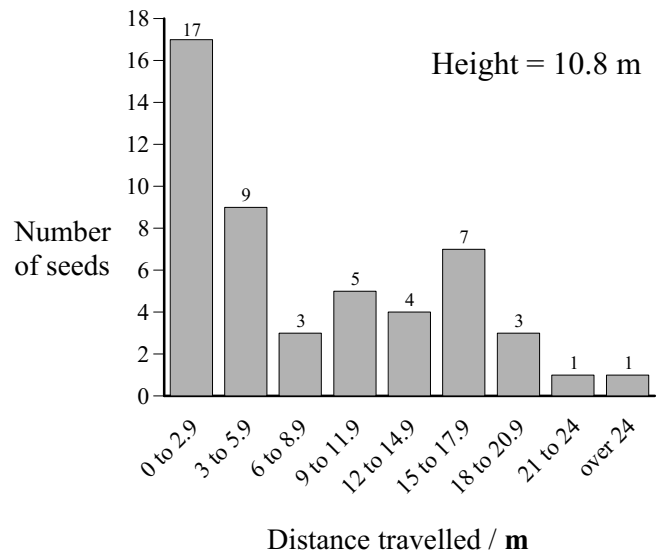
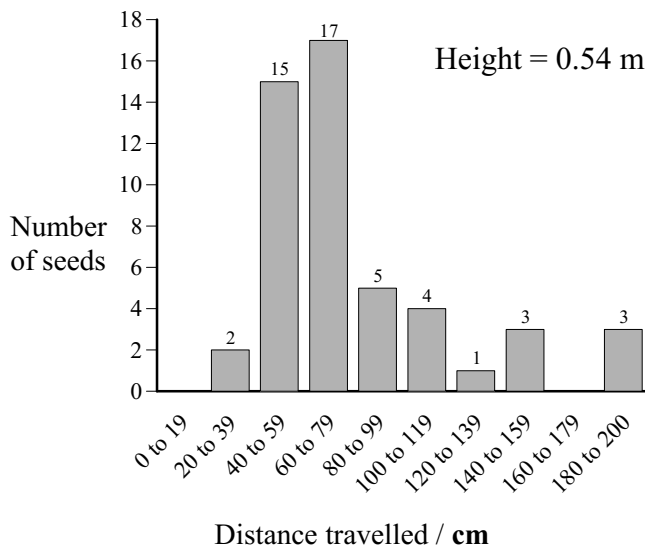
QUESTIONS ANSWERED		EXAMINER	TEAM LEADER	IBCA
SECTION A	ALL	/32	/32	/32
SECTION B				
QUESTION	.....	/20	/20	/20
QUESTION	.....	/20	/20	/20
NUMBER OF CONTINUATION BOOKLETS USED	.....	TOTAL /72	TOTAL /72	TOTAL /72

SECTION A

Candidates must answer **all** questions in the spaces provided.

1. Seed dispersal is important in the migration of plants from one area to another area. Plants have evolved many methods, both physical and biological, by which to disperse their seeds.

50 maple seeds, which are wind dispersed, were dropped one at a time from two different heights, 0.54 m and 10.8 m respectively. The histograms below show the distribution of the distance the maple seeds travelled.



[Source: student experiment, Guralnick]

- (a) For each height, identify the distance travelled by the greatest number of seeds. [1]
 - (i) Height = 0.54 m:
 - (ii) Height = 10.8 m:
- (b) State the effect of height on seed dispersal. [1]

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- (c) Suggest **two** reasons for the effect of the drop height on the distance travelled by the seeds. [2]

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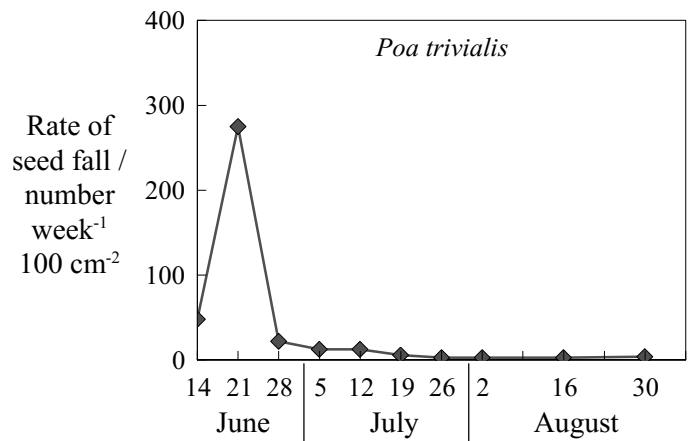
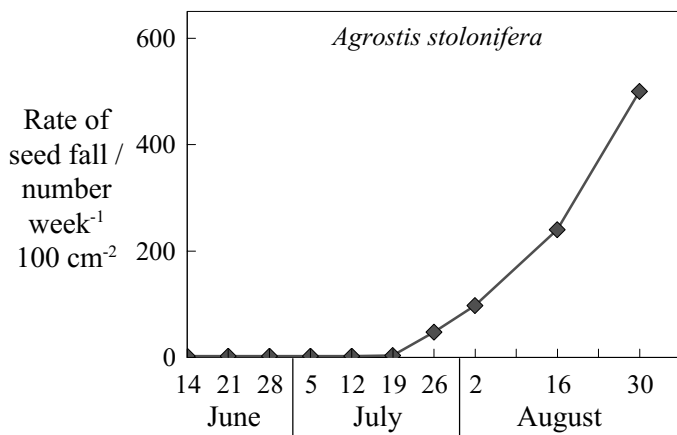
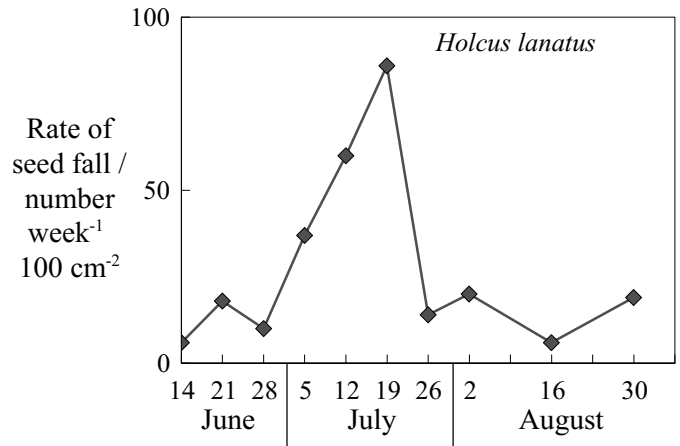
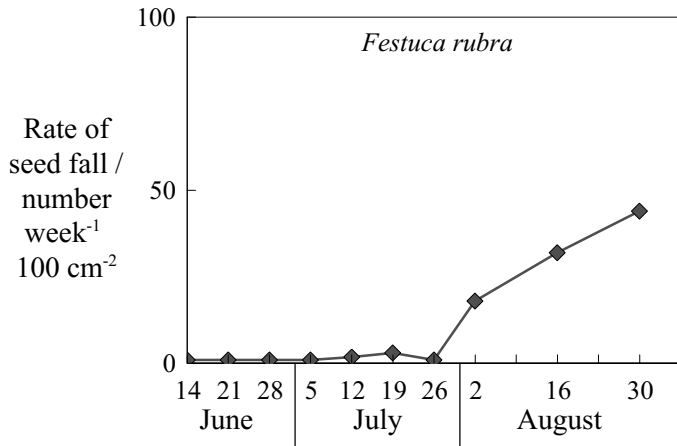
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(Question 1 continued)

The following graphs show the rate and timing of seed release from different species of grass in the same area during the summer.



[Source: J L Harper, *Population Biology of Plants*, Academic Press (Harcourt Brace Jovanovich) 1997, page 57]

(d) Identify the grass species which produces the most seeds in this area. [1]

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(e) Identify the grass species which produces the most seeds in June. [1]

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(f) Compare seed production for all species relative to the timing of their release. [3]

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(Question 1 continued)

- (g) Suggest **two** benefits for these plants in the timing of seed release.

[2]

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Biological seed dispersal is usually dependent on the nutritional content of the seed or fruit. The following table gives the nutritional content for fruits of different species in temperate and tropical climates.

Common Name (<i>genus</i>)	Percentage by Dry Weight			Dispersal Agents
	Protein	Lipid	Carbohydrate	
Temperate				
Cranberry (<i>Vaccinium</i>)	3	6	89	Birds
Hawthorn (<i>Crataegus</i>)	2	2	73	Birds
Pin cherry (<i>Prunus</i>)	8	3	84	Birds
Pokeberry (<i>Phytolacca</i>)	14	2	68	Birds
Strawberry (<i>Fragaria</i>)	6	4	88	Birds
Tropical				
Bird palm (<i>Chamaedorea</i>)	14	16	55	Birds
Fig (<i>Ficus</i>)	7	4	79	Bats
Mistletoe (<i>Viscum</i>)	6	53	38	Birds
Monkey fruit (<i>Tetragastris</i>)	1	4	94	Monkeys
Wild nutmeg (<i>Virola</i>)	2	63	9	Birds

[Source: H Howe and L Westley, *Ecological Relationship of Plants and Animals*, Oxford University Press 1988, page 121]

- (h) Compare tropical fruits to temperate fruits in relation to the mean values for lipid, carbohydrate and protein content.

[2]

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(Question 1 continued)

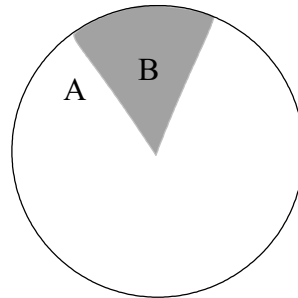
- (i) Explain which fruit would have the highest energy content. [2]

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- (j) Suggest **one** advantage and **one** disadvantage of dispersal of seeds by animals. [2]

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2. According to cell theory all cells arise from pre-existing cells. The following diagram shows the cell cycle of a eukaryotic (body) cell of a diploid organism.



- (a) Define the term *diploid*. [1]

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- (b) Identify the parts of the cell cycle labelled A and B. [1]

A.

B.

- (c) State **three** activities that occur during part A of the cell cycle. [3]

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- (d) Outline the differences in cytokinesis in animal and plant cells. [2]

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(Question 2 continued)

- (e) Explain the significance of complementary base pairing in relation to the cell cycle. [3]

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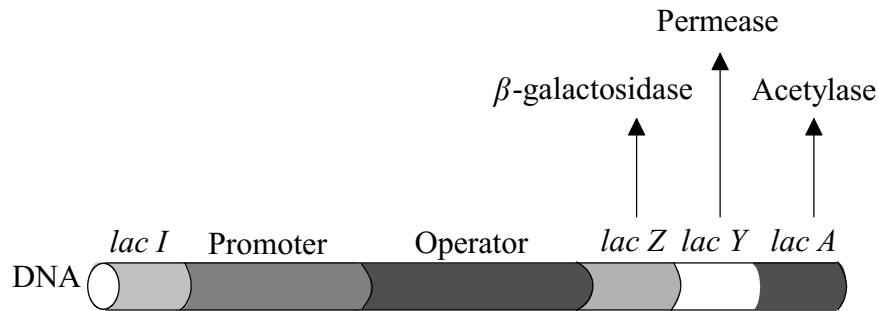
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3. The following diagram shows the lac operon which helps to regulate the expression of genes.



[Source: Riki Lewis, *Human Genetics*, 3rd Edition, William C Brown, (1999), page 158]

- (a) Outline the term *operon*. [2]

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- (b) Outline the relationship between the lac operon and transcription. [3]

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SECTION B

*Answer **two** questions. Up to two additional marks are available for the construction of your answers. Write your answers in a continuation answer booklet. Write your name and candidate number on the front cover of the continuation answer booklets, and attach them to this question paper using the tag provided.*

4. (a) Describe, with the aid of a diagram, the behaviour of chromosomes in the different phases of meiosis. [5]
 - (b) Explain how meiosis and fertilization can give rise to genetic variety. [6]
 - (c) Compare the processes of spermatogenesis and oogenesis. [7]

 5. (a) Outline the role of the phloem in the active translocation of biochemicals. [5]
 - (b) Describe the metabolic events of germination in a starchy seed. [5]
 - (c) Explain how abiotic factors affect the rate of transpiration in a terrestrial plant. [8]

 6. (a) State **one** example of an infectious disease caused by a member of **each** of the following groups: virus, bacteria, fungus and protozoa. [4]
 - (b) Outline the process of immunization. [6]
 - (c) Discuss the benefits and dangers of immunization against bacterial and viral infections. [8]

 7. (a) Outline the production of a dipeptide by a condensation reaction. Include the structure of a generalized dipeptide in your answer. [5]
 - (b) Explain the process of translation. [9]
 - (c) List **four** functions of proteins, giving an example of each. [4]
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